DOCUMENT RESUME

ED 259 721 IR 011 773

AUTHOR Rubin, Philip A.
TITLE A Primer on Electronic Text Technology for College Administrators. Report Number Four of the Electronic Text Report Series.
INSTITUTION Rubin, Bednarek and Associates, Inc., Washington, DC.
SPONS AGENCY Electronic Text Consortium.
PUB DATE 84
NOTE 33p.; For related documents, see IR 011 729, IR 011 772-775, IR 011 802-803, and ED 255 181. The program on Electronic Text for Higher Education is supported by the Annenberg/CPB Project.
PUB TYPE Guides - Non-Classroom Use (055)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Computers; *Databases; Distance Education; Electronic Equipment; Higher Education; Home Programs; *Information Dissemination; Information Networks; Information Services; *Program Development; *Telecommunications; *Television; *Videotex
IDENTIFIERS Electronic Mail; *Electronic Text

ABSTRACT

Intended as an introductory level treatment for readers with little technical background, this primer focuses on the technology of electronic text, its current utilization, and potential use. Included are explanations of the terms associated with electronic text, an exploration of the use of television in providing videotex services, a call for standardization of computer coding schemes and protocol (the particular order in which data are sent), sample electronic text screen displays, and definitions and explanations of databases, videotex services, and teletext. This document also provides sample flowcharts of how videotex and teletext might work, and reviews some technology and system issues that a college administration must address in developing a plan for the utilization of electronic text. These include an assessment of college broadcast, storage, and equipment resources, and decisions as to where centers of text creation will be located. The concluding section challenges the reader to respond to the possibilities and existing potential in the use of electronic text. (JB)

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Electronic Text Consortium

Electronic Text for Higher Education

San Diego State University, University of Wisconsin, University of Nebraska, WGBH Boston

ED259721

A PRIMER ON
ELECTRONIC TEXT TECHNOLOGY
FOR COLLEGE ADMINISTRATORS

Report Number Four
of the
Electronic Text Report Series

U.S. DEPARTMENT OF EDUCATION
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A PRIMER ON ELECTRONIC TEXT TECHNOLOGY FOR COLLEGE ADMINISTRATORS

(Report Number Four)
of the
(Electronic Text Report Series)

Prepared by

Philip A. Rubin
Rubin, Bednarek and Associates, Inc.
Washington, D.C.

for the

Electronic Text Consortium

An Annenberg/CPB Project

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1984

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INTRODUCTION

Many of the largest institutions in the United States, profit and non-profit, believe that a giant information industry is taking shape in the world today. By the turn of the century, communication experts believe that cities will be wired with communication grids which will link every home, corporation and school with libraries, information banks and computer centers. This new electronic environment will make available a broad spectrum of information at the touch of a button or a mere verbal request.

In this turn of the century senario, people will be capable of performing the tasks of working, shopping, banking and learning without leaving home. They will use the technologies of information retrieval systems in their "electronic cottages" and will receive and communicate using "electronic text," "videophones," "electronic banking," and "electronic shopping." Some of these futuristic services are no longer what one would call science fiction, but are available today. This primer will focus on that aspect of the technological future involving "electronic text" and provide the reader with a basic understanding of the technology, as well as the answers to some critical planning questions in this field. It is intended to be an introductory level treatment for those readers who have little or no technical background.

THE BUILDING BLOCKS OF ELECTRONIC TEXT

Let us begin this primer by explaining some of the terms associated with "electronic text." Alphanumerics are letters, numbers and punctuation marks, essentially the characters produced by an ordinary typewriter. These characters can be converted into electronic signals for storage by computer devices. Every computer stores numbers, letters and symbols in a coded form. One code commonly used in this storage process is called ASCII (pronounced as-key) in which each alphanumeric character is assigned an eight digit binary number. For example, the capital letter A is 10100001; the number 7 is 01010111. ASCII is currently the most popular code in data communications and is used almost exclusively to represent data internally to microcomputers. There are other codes employed to represent alphanumerics inside computers such as the six-bit BCD code and the eight-bit EBCDIC (pronounced eb-sa-dik) code in most big IBM machines.

Characters and symbols stored in a computer's memory are called records or files. The term used will depend on its size and relationship to other material in storage. If the file gets very big and begins to include many related but independent elements it may be called a data base (or data bank). Very often, redundant information is stored in computers as new records are created without examining all the files in storage. A data base allows designers to consolidate record storage by relating the information being entered into the computer in a more systematic way. Although there are differences of opinion as to what

constitutes a data base system, the most widely held view is that such systems are designed around a centralized and integrated data file which emphasizes both the independence and relational aspects of data. Thus some data bases might contain a large amount of widely varying but related data such as all of the details of a company's business, while another data base might restrict itself to the price history of the Chicago Commodity Exchange. What is common in both situations and important to note is that the data, while related in one way or another, is still independent. There are presently more than 2,000 publicly available data bases and they are increasing at a rate of 20 to 30 percent per year. Many of these data bases are online, meaning that the data base can be accessed at any time using the public telephone system.

Individual corporations, universities, state and federal agencies also have data bases. Many of these are private with access limited to employees or other defined groups. Examples of some well known online data bases include, Dow Jones News Retrieval, New York Times Data Base, Lexis, legislative data bases (these are extremely popular during pre-election periods), the patent data base, vendor data bases and others. The biggest users of online data bases are universities, stock brokerage houses, government agencies, industry, legal and medical professions, not-for-profit groups, and public libraries. Of those listed, the legal profession has been the heaviest user, followed by industry, government and colleges.

When the computer stored information contained in a data base is displayed on a TV screen or printed out, it is called electronic text. There are a variety of systems in use today which require the use of electronic text to operate. One of these is electronic mail. Although there is no general agreement on what is meant by the term "electronic mail" let us define it as any kind of message system that uses computer technology. We can be even more specific and say that an electronic mail system is one that can store and deliver, by electronic means, messages that might otherwise be forwarded through the postal service or sent verbally over telephone lines. Another system which uses electronic text is word processing. Here, information, letters or reports are inserted into computer memories for editing and storage prior to being printed out and distributed. Word processing has revolutionized office operations in the 1980s and is the precursor for a more comprehensive office automation that will likely take place by the end of this decade.

To further clarify the term electronic text it may be helpful to discuss what electronic text is not. When a TV station places a sign in front of a camera and the words or numbers are transmitted to a TV screen, this display is still ordinary television and not electronic text. The difference between television text and electronic text is the computer storage.

THE USE OF TELEVISION IN ELECTRONIC TEXT

For years, the general public has used television as a source of entertainment and, to a lesser extent, as a source of

information. The public has also become accustomed to viewing alphanumerics on the TV screen, either at home, in an office setting or in a school location. During elections, for example, voting results are often shown on the home screen in an effort to explain complicated statistics whose comparative relationships might be lost if an announcer merely related a series of numbers. The use of script, numbers and symbols in conjunction with other video material can expand a user's ability to understand and absorb information from a television screen. Further, the public has been trained to read statistical information through the increasing use of bar charts, graphs and numerical listings in newspapers, magazines, sports arena scoreboards and information terminals in airports.

Recently, it has become technically feasible to enhance the presentation of alphanumerics in electronic text by adding colors and graphics. One of the technologies which has made this possible is known as videotext. Videotext systems provide users with access to large data bases in which the presentation of information is advanced through the use of color graphics. Additionally, videotext systems have been organized to be relatively user friendly, a characteristic which previous data bases did not possess. Like most data bases, videotext can be accessed at any location that has a telephone line and or in some cases, over cable television. In a typical videotext system such as the

Viewtron* system being operated by Knight-Ridder, a large data base has been constructed in which information is available in the form of pages each of which have been designed to be viewed on a TV screen. Every page is stored as a separate unit in the computer and retrieved by the user on command. The pages are stored in a hierarchical structure which requires the user to work his way through a series of menus in order to arrive at the desired information. Information in the system is organized into pages or "frames." Each page not only contains the specific information which a user requests, but is also constructed with interesting colors and graphics to make the information more understandable and interesting. Videotext is interactive since the user works his way through the data base by commands which instruct the system as to which page is to be retrieved.

Another use of electronic text which is just starting to be used in everyday television involves the transmission of text and graphics to the home simultaneously with the TV picture. The TV signal is not being replaced by the data stream. Rather, the data stream is added to and accompanies the broadcast signal. This new technology called teletext is based on a complicated data transmission method which encodes the information and embeds

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*Viewtron is a videotext service offered by Knight-Ridder Newspapers in conjunction with AT&T. The service, currently available in Florida, provides information, electronic mail, electronic banking, shopping services and games.

it in the TV picture such that both the picture and the information are being sent over the airwaves at the same time and neither interferes with the other. Sending both signals simultaneously is similar to having two channels available at no extra spectrum cost. To receive teletext the user must have a TV set and an electronic device which can translate the computer generated data into screen characters and graphics. This item is called a decoder.

THE QUESTIONS OF STANDARDS

Since all electronic text uses computer codes to store and send information to users, it would be very helpful if all used the same coding schemes and protocols (the particular order in which data are sent) for their systems. Unfortunately, this has not been the case to date. Approximately eight different text standards are in use in the world today, although users in the United States are pushing for common standards and appear to be making headway. Standards are important for several reasons. A common code and protocol allows manufacturers to mass produce decoding devices, thus reducing the cost of receiving and displaying electronic text. The common TV set is an extraordinarily complex device. Because a television standard was adopted for this country in the early 1950s, manufacturers have been able to mass produce sets and sell them for a much lower price in 1984 compared to 1950, after inflation is factored into the price. Another reason that standards are important concerns the availability of service. If Channel 2 in your area used a

different system to transmit its television than did Channel 4 (or whatever two local channels you have), you would only be able to receive a single service unless you purchased and installed a second system. Imagine what would happen in an area like New York where some fifteen different channels are available. If each used a separate system, it would take fifteen TV sets to have full service. Software for computers would be more widely available and less expensive if every computer used the same operating system. There is a similar problem in home video recorders. Currently, there are two home video standards and a third on the horizon. Beta and VHS are soon to be joined by 8mm. It's already difficult to share tapes with friends or colleagues who have the other standard. Our software becomes less transferable and therefore less usable as more standards enter the market.

The final reason standards are important for electronic text concerns transmission. Currently electronic text can be delivered over telephone lines, cable, broadcast over-the-air, and on "floppy disks." Since the information coming to the user for display is coded in binary form (those long strings of 0's and 1's described earlier) the "pipeline" or transmission medium must be capable of carrying digital signals. Very high data rates are difficult for telephone systems and for most broadcast delivery channels (radio and television). A transmission standard would allow all information to use the same "pipeline," in the same way, thereby increasing reliability and reducing cost.

The sections of this primer which follow, will attempt to explain how electronic text technologies work, as well as what uses are being made of them today. Some possible effects which this technology can have on higher education will be suggested. But first it would be helpful to look at some pictures of electronic text. The next two pages contain photographs of TV screens which are displaying electronic text. The first page of sample TV screens presented is in black and white, and is an example of what ASCII looks like. The following page demonstrates both the graphic and color capabilities of the new text services. Notice that some of the screens are geometrically complex using lines, curves and polygons, while others are constructed in simple block mosaic patterns. Some electronic text pages can approach photographs in their renditions. Examining these pages will give the reader a sense of what is available today using the text technologies.

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*** STARGRAM ALERT  YOU HAVE MAIL  ***

*** NEWS ALERT ***
CORN PRICE APPROACHES TRIGGER ANS01

Enter MENU, ?, code/s or keyword/s <RET
*

                                DCONN  NEXT*
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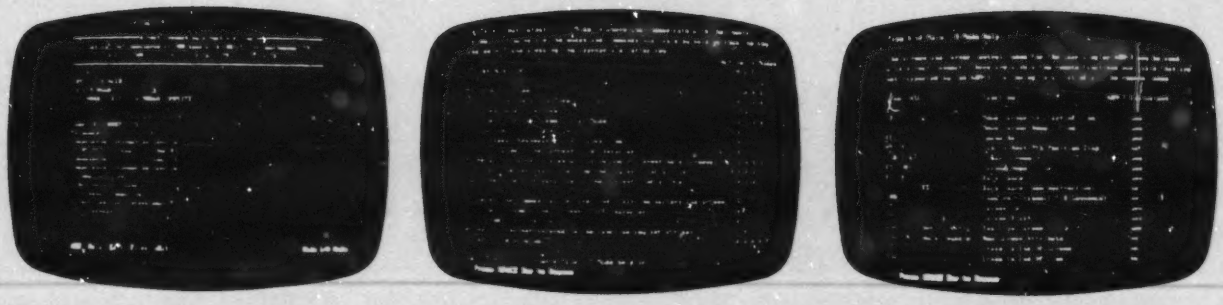

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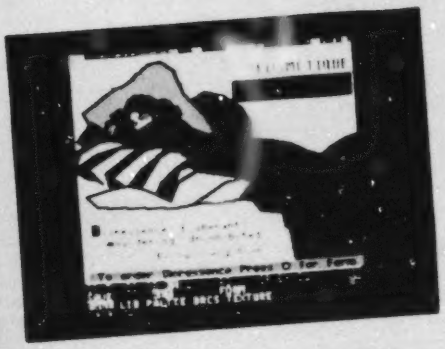
Born 1925, Educated Grantham High School and Somerville College, Oxford
M.P. for Finchley 1959-74
M.P. for Finchley and Barnet 1974-
Prime Minister and First Lord of Treasury 1979-



DATA BASES

The general definition of a data base is any organized collection of information. This broad definition would include, for example, a library, or the library's card catalog. In today's environment, however, the term data base most often refers to a collection of information which is in "machine readable" form. As discussed earlier, data bases come in many shapes and sizes. Some are openly marketed to the public, and some are very private. There are two types of data bases which are commonly sold to the general public:

(1) source data bases, and

(2) bibliographic data bases

A source data base provides the user with direct access to basic information, such as financial reports, census data, legal and medical information, market research studies, and a general body of statistics in a wide variety of fields. One example of this type of data base is INPADOC, which provides information on 16,000 new patents per week from 47 countries. It allows retrieval of all patent documents issued by 50 different patent offices. A bibliographic data base abstracts and indexes information from periodicals, books and reports. An example of this type of data base is ISI/BIOMED, which provides coverage of all biomedical journal literature.

Most of today's data bases have been in existence for some time but have not been accessible by the public. A few corporations, libraries or individuals could afford to buy copies of the

various data bases but most could not nor was storage available if they had copies. Enter the online industry which depended on widespread and inexpensive telecommunications facilities to allow individuals and companies to link up with the existing data base industry. Through value-added carriers such as Tymnet and Telenet, users with small terminals could access the world of data bases by simply paying a subscription charge or hourly use charges (or both). The first online vendor of data bases was Lockheed's DIALOG which become available in 1972 and which offered ERIC, the Education Resources Information Center data-base, via Tymnet. Today, DIALOG makes available over 100 data bases.

Some of the more popular data bases include the New York Times Information Bank which contains over one million records. These consist of articles which have appeared in the Times as well as over 75 other major newspapers. Other popular data bases include the Source, owned by Reader's Digest and Control Data, whose list of available materials includes real estate/homes, stocks, taxes, travel, entertainment, health, education, games, science and technology, money matters, and electronic mail; Compuserve containing news, stock trading statistics, College Board information, commodity news service, entertainment and electronic mail; Dow Jones News Retrieval covering all news developments from the Wall Street Journal, Barron's, and information on 6,000 publicly held companies, 50 industries, 20 government agenices, as well as a stock market quotation service and

full text searching of stored information; and a Career Placement Registry containing the resumes of over 10,000 college and university seniors and recent graduates, for use by recruiters and potential employers.

While there are costs associated with accessing and using the thousands of data bases in the United States, there is also a free quarterly newsletter, Computer Data Report, which compiles listings of data bases and computer based files that can be accessed free of charge. Computer Data Report also publishes information about the contents and rates of data bases that do charge fees. In some cases, the same information available for a fee from commercial services can be acquired free from government sources. The newsletter, free on a quarterly basis, is also available for $48/year on a monthly basis from USA, 12400 Beal Mountain Road, Potomac, MD 20854.

VIDEOTEXT

Videotext is a technology that enables users to access large data bases where text and graphical information has been stored. The information is retrievable using relatively simple access procedures. Unlike most data bases where the stored information is normally oriented towards a single discipline or goal, videotext is intended by its creators and supporters as a system to be used in the home environment, by the unsophisticated user. In other words, it is designed as a mass-market service. To accept this challenge the system must have certain attributes. It must be attractive, friendly, useful and inexpensive. In attempting to meet these goals, industry designers have made major strides. For example, the information in videotext is stored in the form of "pages" of text which have been enhanced through the use of color and graphics as opposed to the black and white, text-only ASCII data bases. Users find this presentation of data to be more acceptable than screens full of text. In order to make the service available from the home, a user can make contact and extract information from a videotext system using an ordinary phone line and modem or over some of the newer cable systems. The information in a typical system has been arranged in a manner which allows almost any user to find the data he or she desires. Simple menus and choices allow the users to arrive at the page of information desired in a straightforward fashion. Many of the existing videotext systems are providing a broad range of consumer services, e.g., banking and shopping at home in addition to

information. Also, some systems have tested games and educational programs in their search for the right mix of services that can trigger a broad consumer response.

At present the biggest roadblock to the success of videotext as a consumer technology centers around the development of an affordable home terminal. Videotext terminals are still quite specialized and can cost anywhere from $600 to $1000. One means of skirting this problem is to sell software packages that allow home computers to be used as videotext receivers. This strategy appears to be a major element in the planning activities of major videotext operators. One company called Avcor sells just such a package for the Commodore 64 computer for $100. Since the computer costs less than $200 and is already in many homes, this represents a possible low cost alternative to specialized terminals such as AT&T's Sceptre terminal.* Still, a widespread affordable home device is not yet on the market.

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*The Sceptre terminal, manufactured by AT&T Communications, is required by users who wish to access the Knight-Ridder Viewtron service. Although this service is designed to serve the Florida area, it is accessible from any location.

TELETEXT

Teletext is a system of delivering electronic text directly to a home, school or office using a broadcast television signal as the carrier. A user is required to have a TV set and a teletext decoder. Presently the decoder is a separate device which is connected to the TV set much the same as a videogame player. As teletext standards are adopted and manufacturers begin to mass produce decoders, these units will be integrated into TV sets.

At the core of an operating teletext system is a computer located at a television station. It contains a data base of information which has been formatted into "pages" of text and graphic material. Each page is designed to fit on a typical TV screen. The station arranges these pages in a particular logical order and then proceeds to broadcast a complete cycle of the pages, one after another. A typical cycle may contain anywhere from 50 to 200 pages. The pages of information are embedded in the TV signal in such a way as not to interfere with the basic TV picture. Further, they are available on command to a user with the proper equipment. As the cycle of pages is being transmitted in numerical order (i.e., page 1, page 2, page 3, etc.) a keypad which is part of the decoder system, enables the viewer to select one of the pages in the cycle for viewing. The decoder intercepts the desired page, reads the data in the stream, converts the data to text and graphics, and displays the page on the viewer's screen. Teletext does not disrupt regular program viewing. The pages are seen only on those sets which are equipped

with decoders and switched to the teletext mode. Every TV station is capable of transmitting teletext pages as an ancillary service.

Before describing exactly how broadcast teletext works, it is important to know some details about television transmission. A TV picture in the United States is composed of 525 lines which are progressively scanned across the picture tube (screen) thirty times (every complete scan is called a frame) each second. Because 30 frames per second would cause flicker, the screen is scanned sixty times each second (every one of these scans is called a field) with every other line scanned. Thus in field 1 of frame 1, the 262 and one half odd lines are scanned (1, 3, 5, 7, etc.). For field 2 of frame 1, the even 262 and one half lines are scanned. The phosphorescent screen causes the two images to blend together into a coherent picture. In actuality the home set is incapable of providing perfect registration and the viewer is seeing much less resolution than 525 lines. In any event, the picture is very adequate for home viewing.

Each time a line is scanned, a stepping motor moves the electron gun two lines down (remember we're scanning alternate lines) to begin another scan. When the last line in the picture has been scanned, the beam returns to the top of the screen and prepares to build another picture. This effect can be readily observed by loosening the vertical hold control on a typical TV set and observing the thick black bar running along the top of the picture. This bar represents the first 21 lines of the

picture which are never transmitted. The time set aside for these lines is taken up as the TV set attends to those tasks associated with starting a new picture (e.g., synchronization). The time represented by the black bar is 1334 microseconds (millionths of a second). Since no picture is being sent or displayed during this time period, the broadcaster may use the time for other purposes such as sending data to the viewer's TV set. This time period is called the vertical blanking interval. The name is derived from the fact that the TV screen is blanked out (with a black bar) during the time the scanning beam is returning to its new vertical starting point. Not all of the time in the vertical blanking interval can be used for sending data. The first ten lines are taken up with synchronization details. The next four could be used but are likely to cause interference on some older TV sets. Lines 15 through 20 are available by line numbers. It is simpler to talk about lines than multiples of 63 microseconds (the duration of each line), even though we are not transmitting lines of TV at the time of the vertical blanking interval. Presently, each line is capable of carrying 28 bytes of information that can be used in forming pages. Other data are also sent in the time period of each line but they are used for other purposes such as error correction, synchronization, prefixing, etc. Let us say that four lines are being used for transmitting teletext. Therefore, in any single field, four lines of 28 bytes each equal 112 bytes. Since 60 fields are transmitted each second, that is 6720 bytes per

second. A typical teletext page requires about 1100 bytes of data. Therefore approximately six pages can be sent in one second. If a teletext magazine is composed of 200 pages, it will take 33 seconds for a full cycle to occur. The station repeats the cycle on a continuous basis. Thus if a user requests a page the decoder looks at the pages as they cycle by and selects the correct page for display. If the page has just passed, the decoder must wait for the full cycle of pages to occur before the page appears again. When it does appear, it is captured and stored in the decoder's memory. Here the data are fed into a character generator and displayed on the picture tube. The broadcaster can change the cycle at any time by selecting different pages out of his computer to be added to the cycle; by taking pages off the cycle; or by updating pages which are already part of the cycle. Thus it is possible to transmit very timely information such as weather, traffic reports and the location of mobile health clinics. When located on a college's premises it would be possible to list registration information during that time of year, including the closings of various sections of classes as they occurred. Information which is not subject to change as often (such as monthly schedules of student or faculty events) could also be provided.

The content of teletext pages can be changed to meet emergency needs as well. For example, special pages could be assigned to list school buildings which are closed during severe weather. Teletext content can also be coordinated with regular

television programming. It can for example provide additional materials or references to various class room programs. It could even be a vehicle for delivering examinations at the same time to different locations.

Figure 1 How videotext might work

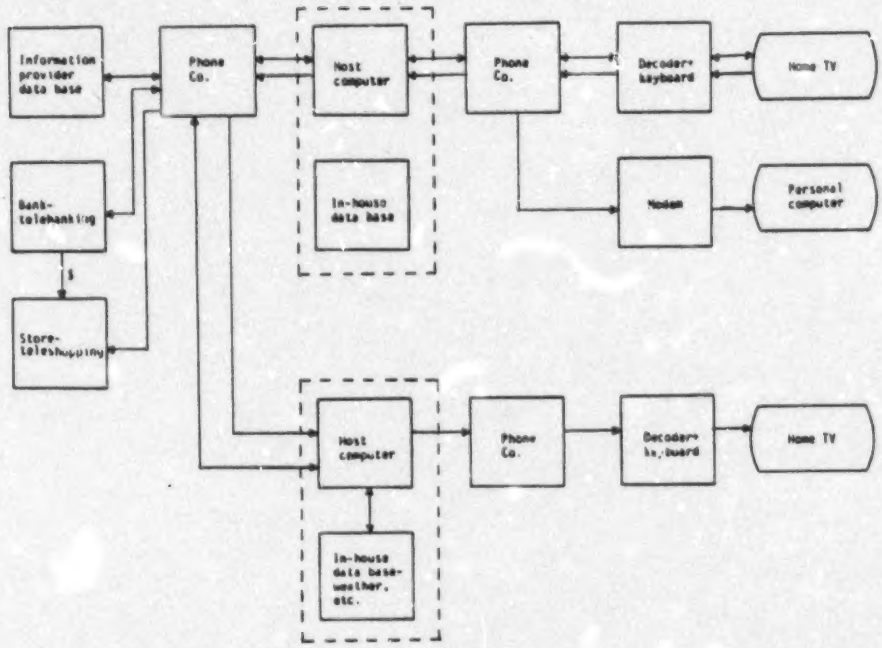
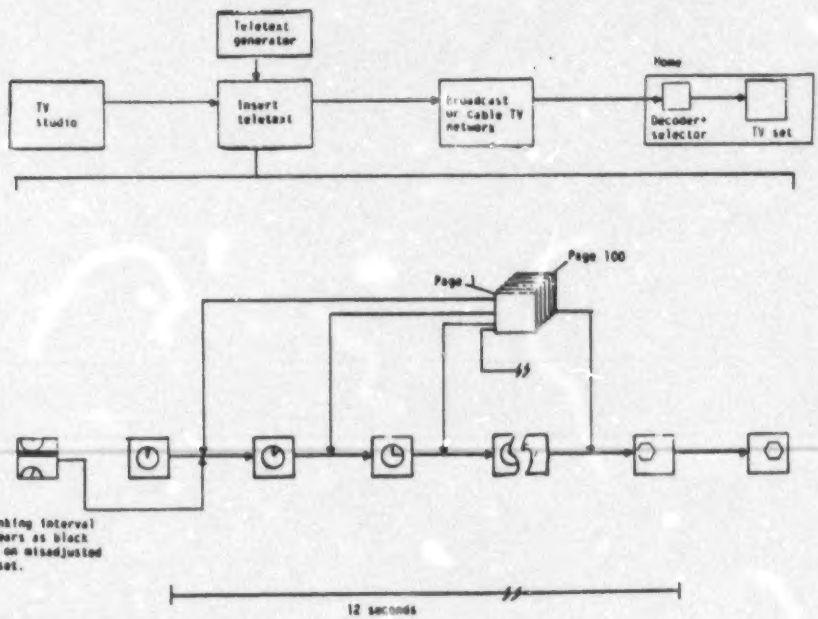


Figure 2 How teletext might work



HOW TO GET STARTED

The purpose of this section is not to suggest specific applications for colleges, but to review some technology and system issues that a college administration must address as plans for using electronic text develop.

Assessing Local Resources

As a first element in the process of readying a campus for electronic text usage, an assessment of college resources is important. This would include broadcast resources, storage resources, equipment in the hands of students and the community, as well as decisions as to where centers of text creation will be located.

With regard to transmission, the following areas need to be examined:

1. Are broadcast TV or radio channels available?
2. Is there an ITFS (Instructional TV system) available?
3. Is the campus wired for cable TV?
4. What type of PBX (private branch exchange) and general telephone facilities exist on campus?
5. Is there a satellite uplink or downlink available?
6. Is there a campus LAN (local area network for computer to computer communication) in existence?

The broadcast channels of a TV station (item 1) can clearly be used for teletext transmissions as described earlier. FM radio channels (item 1) have also been authorized by the FCC for use in downloading data, either in the form of computer software, or as

plain ASCII. The same possibility holds true for television delivered over ITFS (item 2). The availability of a campus cable TV system (item 3) and a telephone system (item 4) have potential for use in delivering videotext services. The ability to interconnect with national services over satellite (item 5) creates a potential for going outside the college community and accessing other services. Finally, the availability of an LAN (item 6) enhances the potential of data delivery of all types.

The second resource area to review concerns storage capability. This would include:

1. What storage is available on campus mainframes?
2. Is storage or programs control available on campus minicomputers?
3. Are computer facilities available at the local PTV or radio stations?

Storage on mainframe computers (item 1) is important for large data bases which might be part of a videotext system. Minicomputers (item 2) on the other hand have been widely used on broadcast teletext systems for page storage as well as software control of the broadcast cycle. Local public broadcasting stations (item 3) might also have computer facilities which could be used for data base and software control purposes.

Penetration of hardware among the student body and community is also an important area to examine. This would include:

1. How many and what type of personal computers are available?

2. Are modems and communication software packages available for the p.c.'s or terminals?
3. Are teletext decoders available?
4. Are videotext terminals available?
5. How many users are there of national services?

The number and type of personal computers available within the student body (item 1) provides an estimate of how many potential videotext receivers are in the college area since many software programs are being created to allow p.c.'s to receive videotext. The ability to access common ASCII data bases with these devices is already established. Modems and communications packages (item 2) allowing the tie-in of the p.c.'s to the phone network are vital to accessing outside data bases. Although the number of teletext decoders (item 3) presently available is quite small, decoders are for sale in many areas and will proliferate widely in the coming years. Both the CBS and NBC networks are distributing teletext pages to their affiliates who in turn are transmitting the service locally. A few stations have already begun adding local pages to the network's national "magazine." Videotext terminals (item 4) such as AT&T's Sceptre are available for between $600 to $900 presently and that cost is dropping quickly. Other manufacturers will shortly have less expensive terminals on the market and some may be available in the campus area since the services are available by telephone and over some cable systems. Finally the number of users of the national services (item 5) such as the Source and Compuserve will provide an indication of

existing interest in such services as well as the availability of communications equipment.

Other areas which require attention include the question of where frame creation equipment will be located and which department of the college will be responsible for its operation (journalism, art, communication, education, television, engineering, or other). Do any of these departments already possess frame creation equipment? Are any p.c.'s available that can be converted into frame creation terminals (a number of options are available for the IBM PC). Are engineering departments up-to-date on teletext and videotext technology and can they be used to put such systems together from the technical end? Is assistance available from the local PTV station?

Other areas to be considered include the following:

1. Are desired services local, regional or national?
2. Does the intended application require two-way or interactive communications?
3. What capacity does the system require? Remember that videotext requires much greater storage than teletext.
4. Are graphics important to the service? Here again, if graphics are not important, then a simple ASCII service could be suitable.

The specific applications planned for the service are of course another area which must be examined in great detail. The parameters of such a service form the specifications for the basic equipment configurations and the operational system. A

decision as to whether the system will be used as a delivery system or communication mechanism or both is central to such deliberations and should be considered thoughtfully.

CONCLUSION

In the not-too-distant future, bound paper-based books, those cherished and venerable items that are so much a part of our upbringing, may only be available in small plastic covered packages containing a single computer chip, molded inside a credit-card sized container which the buyer takes home and watches on a computer screen. Book stores will no long stock "books" as we know them, but copy them from a master chip as they are purchased, keeping count of how many copies are made. All of this will take place in electronic text, that is, the computer stored words and images created in the minds of humans. That same text will also be available by telephone, by fiber optic cable, or over-the-air, either through terrestrial broadcasting or from satellites. Since the information from which books are created is already universally stored in computer controlled printing machines, and the telecommunication mechanisms for its home delivery are largely in place, only the user's willingness to read from an electronic screen is at issue.

Electronic text will continue to play an ever increasing role in our daily activities, be it the search for knowledge, the administration of our businesses, or the amusement of our minds. However, we need to learn a good deal more about its potential applications: <u>how</u> to use this technology in order to extract the maximum benefit from the technology.

Electronic text's use in the higher education environment is well timed to exploit the new sources of information and the

application of computers to learning. Whether used for computer managed instruction, the delivery of program related materials, resource information, supplementary reading lists, timely registration information, freshman orientation materials, examinations, or simple data base access, the use of electronic text in higher education offers significant potential benefits. This primer was intended to provide a starting point for interacting with this new technology. Other documents in this series will examine production issues, research findings, and the design of applications for higher education.